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10/642,914	08/18/2003	Liexiang Fan	2003P08374US	3652

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EXAMINER	
KIM, CHONG R	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/642,914	FAN ET AL.	
	Examiner	Art Unit	
	Charles Kim	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8,9,11 and 13-21* is/are rejected.

7)☒ Claim(s) *7,10 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment and Arguments

1. Applicants' amendment filed on April 11, 2007 has been entered and made of record.

2. In view of Applicants' amendment, the objection to claims 8 and 9 are withdrawn.

3. Applicants' arguments have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

Applicants argue that their claimed invention (claim 1) differs from the prior art because "Yoshihiro does not disclose determining a rate of change." (Remarks, page 6). According to Applicants, rate, pressure, and direction is not a rate of change. (*Id.*). The Examiner disagrees. Yoshihiro is primarily concerned with determining the changes in blood flow [Yoshihiro, paragraph 36]. In particular, Yoshihiro explains that a "rate-of-flow" is calculated to display the flow of a fluid that is characterized as changing [Yoshihiro, paragraph 7]. Thus, determining the rate of flow of a fluid, which is characterized as changing, is construed as determining the rate of change.

Applicants further argue that Yoshihiro does not disclose tracking flow direction and magnitude because "the flow direction is calculated for each image, not tracked." (Remarks, page 7). The Examiner disagrees. The Examiner construes "tracking flow direction and magnitude" as determining the flow direction and magnitude for each image in an image sequence. By making these calculations for each image, the flow direction and magnitude are tracked as a function of time. Here, Yoshihiro discloses determining flow direction and magnitude for each image of an image sequence. (Yoshihiro, paragraphs 45-48). Thus, contrary

to what Applicants contend, Yoshihiro discloses tracking flow direction and magnitude, as recited in claim 5.

Applicants also contend that Yoshihiro and Yoshiya do not disclose that the pattern for one image is responsive to the pattern of another image, as recited in claim 11 (Remarks, page 7). The Examiner disagrees. In Yoshihiro, the second pattern (figure 7B) is responsive to the first pattern (figure 7A) because it represents, through the shift in the elementary streams, the change of the first pattern over a specific period of time, i.e., the time period between figure 7A and 7B. Thus, Yoshihiro discloses a pattern for one image that is responsive to the pattern of another image.

Moreover, Yoshiya teaches these features as well. For example, Yoshiya explains that the acceleration of blood flow is determined and mapped according to a two-dimensional color flow map (Yoshiya, page 5). The acceleration is determined by calculating a difference between the velocity data of the current frame with the velocity data of a previous frame, divided by the time difference between the two frames. (Yoshiya, page 5). Hence, the acceleration data for the current frame is a function of the velocity of the previous frame. Because acceleration is a function of velocity, this suggests that the acceleration of the current frame is also a function of the acceleration of the previous frame. In addition, Yoshiya explains that the acceleration is displayed as a pattern. (Yoshiya, page 6 and figure 5A). Therefore, Yoshiya discloses that the pattern of one image is responsive to the pattern of another image, as recited in claim 11.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-6, 11, 13, 16-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshihiro, J.P. Patent No. 10-94519 ("Yoshihiro"), the English translation of which is attached.

Referring to claim 1, Yoshihiro discloses a method for representing flow with a medical imaging system (pages 2-3, paragraph 10. Yoshihiro explains that the method is performed by a medical imaging system such as an X-ray, CT scanner, or MRI equipment), the method comprising:

a. determining a rate of change of a parameter (page 5, paragraph 45. Note that the "blood flow" is interpreted as a parameter. Thus, computing the rate, pressure, and direction of blood flow determines the rate of change of the parameter); and

b. displaying a change in the parameter (blood flow) over time (figures 7A-7C) as a function of the rate of change [paragraphs 45-48. Note that the change in the parameter (flow) is depicted by the change in the "elementary streams" from figure 7A to 7B, and from 7B to 7C. In addition, the elementary streams in each image are a function of the rate of change (rate, pressure, and direction) as described in step (a); see paragraphs 45-46].

Referring to claim 2, Yoshihiro further discloses that step (a) further comprises:

a1. determining the flow direction and magnitude (paragraph 45. Note that the determined "rate and pressure" of the blood flow is interpreted as a magnitude of the flow. In addition, the flow direction is determined and illustrated by the elementary streams in figure 6); and

a2. determining the rate of change as a function of the flow direction and magnitude [paragraph 45. As noted above in claim 1, computing the blood flow rate, pressure, and direction determines the rate of change of a parameter. Thus, the rate of change is a function of the flow direction and magnitude (rate and pressure)];

wherein (b) comprises displaying the change as a perceived motion of a pixel (paragraph 46-48, figures 7A-7C. Note that the changes in the elementary streams shown in figures 7A-7C represent a perceived motion of a pixel).

Referring to claim 3, Yoshihiro further discloses that step (b) further comprises displaying a pattern for a plurality of pixel locations, the pattern varying as a function of the rate of change [paragraph 46-48, figures 7A-7C. Yoshihiro explains that the "change of the blood flow" is determined, and illustrated by the elementary streams in figures 7A-7C. Note that the elementary streams comprise patterns of a plurality of pixel locations. In addition, these patterns vary as a function of the rate of change--the rate, pressure, and direction of the blood flow varies (paragraphs 45-46)].

Referring to claim 4, Yoshihiro further discloses that step (a) further comprises determining the rate of change as proportional to motion for pixels associated with flow [paragraphs 45-48. As mentioned above (claim 3), the "change of the blood flow" is determined,

and illustrated by the elementary streams in figures 7A-7C (paragraph 48). Note that the variations in the elementary streams from figure 7A to figure 7B and from figure 7B to 7C represent motion for pixels associated with flow. Moreover, the varying elementary streams from figure 7A to figure 7B and from figure 7B to 7C are obtained by determining the rate of change of the parameter--the rate, pressure, and direction of the blood flow. Thus, the rate of change is proportional to the motion for pixels associated with flow, i.e., variations in the elementary streams].

Referring to claim 5, Yoshihiro discloses a method for representing flow with a medical imaging system, the method comprising:

a. assigning first display values to each of a first plurality of spatial locations (paragraphs 45-48 and figure 7A. Note that the elementary streams comprise the first plurality of spatial locations. Correspondingly, the pixel values of the elementary streams in figure 7A comprise the first display values);

b. tracking a flow direction and magnitude for each of the first plurality of spatial locations (paragraph 45. Note that the flow rate, pressure, and direction are determined for each point in the blood vessel);

c. identifying a second plurality of spatial locations as a function of the flow directions and magnitude (figure 7B. Note that the elementary streams in figure 7B represent a shift from the elementary streams from figure 7A. This shift is based on the changes in the flow directions and magnitude from figure 7A to 7B);

d. assigning second display values to each of the second plurality of spatial locations as a function of the first display values (figure 7B. Note that the display values of the shifted

elementary streams in figure 7B are the same as the display values for the elementary streams in figure 7A).

Referring to claim 6, Yoshihiro further discloses that step (a) comprises generating a first pattern (elementary streams) for the first plurality of spatial locations for a first image (figure 7A), the first plurality of spatial locations associated with flow, and step (d) comprises generating a second pattern (shifted elementary streams) for the second plurality of spatial locations for a second image (figure 7B), the second plurality of spatial locations associated with flow, each of the second plurality of spatial locations of the second pattern responsive to the first pattern shifted by the flow direction and magnitude for each of first plurality of spatial locations (paragraphs 45-48. Note that the pattern--elementary stream--in figure 7B represents the pattern in figure 7A shifted by the flow direction and magnitude, as noted above).

Referring to claim 11, Yoshihiro discloses a method for representing flow with a medical imaging system (pages 2-3, paragraph 10. Yoshihiro explains that the method is performed by a medical imaging system such as an X-ray, CT scanner, or MRI equipment), the method comprising:

a. generating a first pattern for a plurality of pixels associated with flow for a first image (paragraphs 46-48. Note that the elementary streams in figure 7A is interpreted as the first pattern for a first image because it comprises a plurality of pixels and represents the blood flow);

b. generating a second pattern for the pixels associated with flow for a second image, the second pattern responsive to the first pattern [paragraphs 46-48. Note that the elementary streams in figure 7B is interpreted as the second pattern for a second image because it represents the blood flow. In addition, the elementary streams in figure 7B (second pattern)

represent a "change in the blood flow" from the elementary streams in figure 7A and therefore, are responsive to the elementary streams in 7A (first pattern)].

Referring to claim 13, Yoshihiro further discloses modulating (adapting) gray scale values of pixel display values for the plurality of pixels (figure 7A). Note that the pixels constituting the elementary streams are adapted to be displayed as gray values.

Referring to claim 16, Yoshihiro further discloses that step (b) comprises generating the second pattern as representing movement of the first pattern [paragraphs 46-48. Note that the elementary streams in figure 7B (second pattern) represent a "change in the blood flow" from the elementary streams in figure 7A and therefore, represent a movement of the first pattern. This movement is clearly illustrated by the shift in the elementary streams from figure 7A to figure 7B].

Referring to claim 17, Yoshihiro further discloses:

c. determining a flow direction and magnitude for each of the plurality of pixels [paragraph 45. Yoshihiro explains that the rate and pressure of the blood flow is calculated "in each point in a blood vessel." Note that the rate and pressure of the blood flow is interpreted as the flow magnitude. Hence, the flow magnitude is determined for each of the plurality of pixels--each point in the blood vessel. In addition, the first pattern (elementary streams in figure 7A) that comprises the plurality of pixels represents the flow direction (paragraph 46) and therefore, the flow direction is determined for each of the plurality of pixels];

wherein (b) comprises generating the second pattern as a function of the flow direction and magnitude [paragraphs 46-48 and figures 7A-7B. Note that the second pattern (elementary streams in figure 7B) is a function of the flow direction and magnitude (of the plurality of pixels

for the first pattern--elementary streams in figure 7A) because it represents the "change of the blood flow" over time (paragraph 48). In summary, the second pattern (figure 7B) is a function of the flow direction and magnitude of the first pattern (figure 7A) because it represents the change in the first pattern over time, which is illustrated by the shift in the elementary streams from figure 7A to 7B].

Referring to claim 18, Yoshihiro further discloses that steps (a) and (b) comprise indicating a direction of flow with a shift of the first pattern to a different position, the second pattern including information from the shifted first pattern (figures 7A-7C).

Referring to claim 19, Yoshihiro further discloses that steps (a) and (b) comprise indicating a magnitude of flow with a shift of the first pattern to a different position, the second pattern including information from the shifted first pattern (figures 7A-7C).

Referring to claim 20, Yoshihiro discloses a system for representing flow in medical imaging, the system comprising:

a. a processor (50) operable to generate an at least partially persistent pattern (elementary streams) in each of at least two images (figures 7A and 7B), the persistent pattern shifted as a function of at least one of flow direction or flow magnitude (paragraphs 45-48); and

b. a display (58) operable to display the at least two images (figures 1 and 7A-7B).

Referring to claim 21, see the rejection of at least claim 5 above.

5. Claim 11 is rejected under 35 U.S.C. 102(b) as being anticipated by Yoshiya et al., J.P. Patent No. 02-161934 ("Yoshiya"), the translation of which is attached.

Referring to claim 11, Yoshiya discloses a method for representing flow with a medical imaging system, the method comprising:

a. generating a first pattern for a plurality of pixels associated with flow for a first image (page 6 in the translation and figure 5A. Note that the pattern 100 in frame t1 is interpreted as the first pattern);

b. generating a second pattern for the pixels associated with flow for a second image, the second pattern responsive to the first pattern (page 6 in the translation and figure 5A. Note that the pattern 100 in frame t2 is interpreted as the second pattern, which represents a shift from the first pattern in frame t1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 8-9, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Yoshihiro, J.P. Patent No. 10-94519 ("Yoshihiro") and Yoshiya et al., J.P. Patent No. 02-161934 ("Yoshiya"), the translations of which are attached.

Referring to claim 8 as best understood, Yoshihiro does not explicitly disclose that (a) and (d) comprise assigning at least one characteristic of the first and second display values as one of modulated gray scale values, color, hue and combinations thereof. However, this feature was exceedingly well known in the art. For example, Yoshiya discloses assigning at least one

characteristic of first and second display values as one of color (page 6 of the translation and figure 5A. Yoshiya discloses color flow map images).

Yoshihiro and Yoshiya are combinable because they are both concerned with blood flow imaging. Yoshihiro's first and second display values represent the blood flow, as noted above. Yoshiya explains that display values representing blood flow could be assigned color characteristics. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the method of Yoshihiro to include the teachings of Yoshiya. The suggestion/motivation for doing so would have been to enhance the diagnosis process by providing color characteristics in addition to flow streams to represent the blood flow. Therefore, it would have been obvious to combine Yoshihiro with Yoshiya to obtain the invention as specified in claim 8.

Referring to claim 9 as best understood, Yoshiya further discloses modulating the first and second display values as a function of color flow signals (page 6 of the translation).

Referring to claim 14, Yoshihiro does not explicitly disclose the step of modulating a color of the pixel display values for the plurality of pixels as a function of a flow characteristic. However, this feature was exceedingly well known in the art. For example, Yoshiya discloses a step of modulating a color of pixel display values for a plurality of pixels as a function of a flow characteristic (page 6 of the translation and figure 5A. Yoshiya discloses a color flow map). For at least the reasons stated above (claim 8), it would have been obvious to combine Yoshihiro with Yoshiya.

7. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Yoshiya et al., J.P. Patent No. 02-161934 ("Yoshiya"), the translation of which is attached, and Mo et al., U.S. Patent No. 6,733,455 ("Mo").

Referring to claims 13-15, Yoshiya discloses color flow imaging of Doppler signals (page 1 of the translation), but does not explicitly disclose that (a) comprises modulating gray scale values of pixel display values for the plurality of pixels. Additionally, Yoshiya does not explicitly disclose either the step of modulating a color of the pixel display values for the plurality of pixels as a function of a flow characteristic, or the step of modulating the gray scale pixel display values as a function of B-mode signals for the plurality of pixels.

Mo discloses that in color flow imaging, the color flow image is formed by modulating gray scale values of pixel display values for plurality of pixels and by modulating a color of the pixel display values for the plurality of pixels as a function of a flow characteristic, which is written onto a B-mode image (col. 3, lines 5-15).

Yoshiya and Mo are combinable because they are both concerned with color flow imaging for Doppler signal systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the method of Yoshiya to include the teachings of Mo. The suggestion/motivation for doing so would have been to enhance the diagnosis process by providing color and gray scale displays. Therefore, it would have been obvious to combine Yoshiya with Mo to obtain the invention as specified in claims 13-15.

Allowable Subject Matter

8. Claims 7, 10, 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Kim whose telephone number is 571-272-7421. The examiner can normally be reached on Mon thru Thurs 8:30am to 6pm and alternating Fri 9:30am to 6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 571-272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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